Missing Value Reason – Reference Guide
Version 1.0, December 1999

Topic **Page**

Summary: Missing Value Reason

Introduction

The Missing Value Reason (MVR) is used in association with other fields to note why those fields are missing. In is not a data element that exists alone, but rather is used in conjunction with the field (or set of fields) that may have missing values.

For example, suppose a person's marital status has been left blank on a completed form. The MVR associated with Marital Status would be used to indicate the reason that the field was left blank. If the reason is that the question about marital status was *not asked*, then the Marital Status Missing Value Reason would be coded as 'C', which indicates "Not Asked/Questioned".

There are two kinds of associated data elements (calculated and stored) and three types of missing value reasons (calculated, selected, and system-generated). Calculated MVRs are associated with calculated data elements, and selected MVRs are associated with stored data elements. System-generated MVRs are associated with both calculated and stored data elements. These are described in detail below.

Definitions

General Definition of Missing Value Reason: The reason the value for the associated data element is missing (i.e., blank). The Missing Value Reason is a separate field, used in conjunction with the associated data element to indicate the reason for the missing value.

Definitions of Types of Associated Data Elements: Associated data elements are either Calculated or Stored. Calculated data elements always use an associated MVR; the use of an MVR is optional for Stored data elements, and is determined by program requirements.

- **Calculated Data Element**
  The value of a calculated data element is determined by the execution of a defined procedure or algorithm, using the values of other data elements. The calculated data element value is, by definition, system-generated and is not collected on hardcopy forms nor entered into an electronic form or stored in the database. All calculated data elements have an associated MVR, which is provided by the system. (Example: the system compares a person's stated date of birth with the date on which the person was examined, and finds that the two dates make the person 175 years old. The Calculated Age data element is then associated with the MVR of "I" for Invalid Value.)

- **Stored Data Element**
  The value of a stored data element is captured on hardcopy and electronic forms, or determined during data entry, and is stored in the database. All stored data elements defined in CIPHER are character fields with a missing value of all blanks. The reason the value is missing may or may not be captured in a separate associated MVR. Each program determines whether the stored data element requires an MVR.

Definitions of Types of MVRs:

There are three types of Missing Value Reasons: Calculated, System-Generated, and Selected.

- **Calculated MVR**
  If the value of the associated data element is calculated, the MVR value denotes the reason the defined procedure/algorithm failed to derive a value based on the input parameters. The MVR data associated with a calculated data element are also calculated data. That is, a calculated data element will have an associated calculated MVR. The calculated data element and calculated MVR are the

minimum output parameters for an algorithm. The calculated MVR value is always system-generated, and is not stored in the database.

- **System-Generated MVR**
  If the value of an associated data element, entered into the system through an electronic form or EDI, is determined to be missing based on the system validations/processing logic, the value is set to blank and the system generates an MVR value. The values of both the associated data element and the MVR are then stored in the database. Three scenarios are addressed:
  (1) The value of another stored data element generates an automated skip pattern that determines that the value of this data element must be missing (e.g., pregnancy status for males);
  (2) The data element value provided on the hardcopy form does not pass the validation edits, and the user keys an asterisk into the field to denote an invalid value;
  (3) An EDI message has a missing value for a stored data element; the associated MVR field is also blank, because the sending system does not use the MVR.

- **Selected MVR**
  The MVR value is identified at the time of data capture on the hardcopy form(s) used for data entry. The associated data element is indicated as missing (i.e., left blank on the form) and the MVR value is selected on the hardcopy form, based on the situation. The data element value of blank and the selected MVR value are entered into an electronic form and stored in the database.

Data Storage and Field Values

Variable Name:	A composite of the associated data element's variable name and the suffix _MVR (e.g., DOB_MVR for a person's date of birth)
Type:	character
Length:	1
Reported to CDC:	TBD – dependent on the associated data element
Field Values:	Refer to Missing Value Reason Field Values Table on next 4 pages.

Missing Value Reason Field Values Table

The valid values and descriptions for Calculated, System-Generated, and Selected MVR data elements are shown below, followed by a discussion of the defined flexibility in their use.

"CALCULATED" MISSING VALUE REASON DATA ELEMENTS						
Code	Label	Hardcopy Form	Electronic Form	System Generated	Algorithm Generated	Description
M	Missing Input Parameter			✓	✓	A separate data element required for determining the value of this data element is missing; therefore, the value of this data element cannot be determined. System-generated: both the data element and MVR are blank on an incoming EDI record. Algorithm-generated: a required input parameter is a missing value (i.e., all blank) and the algorithm cannot derive a calculated value.
E	Edit Failed, Invalid Value			✓		The value provided for the data element does not pass the defined validation edits and is therefore invalid. The value of the data element is set to all blanks to pass the edits.
P	Missing due to Skip Patterns			✓		The data element value is set to all blanks by the system due to skip patterns while editing the electronic form. The skip pattern is dependent on the value of another data element (e.g., the system will skip pregnancy-related questions for males).

"SYSTEM-GENERATED" MISSING VALUE REASON DATA ELEMENTS						
Code	Label	Hardcopy Form	Electronic Form	System Generated	Algorithm Generated	Description
M	Missing Input Parameter			✓	✓	A separate data element required for determining the value of the data element is missing; the value of the data element cannot be determined. System-generated: both the data element and MVR are blank on an incoming EDI record. Algorithm-generated: a required input parameter is a missing value (i.e., all blank) and the algorithm cannot derive a calculated value.
N	Result Not Well Defined				✓	The algorithm procedure is unable to derive a data element value based on the values of the input parameters (e.g., the dates provided for the input parameters are not sufficient to calculate an age value because too many date components are missing).
F	Failed Calculation				✓	The derived data element value does not pass the edits and is invalid. The algorithm cannot calculate a valid response because of various conditions (e.g., invalid arguments).
Z	Presumed No			✓		Applies to check-box fields. If the check-box field is 'checked', the value assigned to the variable is 'Y' (Yes). If the check-box field is 'not checked', the value assigned to the variable is ' ' (blank) AND the associated MVR is set to 'Z' to indicate a presumed response of No.

"SELECTED" MISSING VALUE REASON DATA ELEMENTS						
Code	Label	Hardcopy Form	Electronic Form	System Generated	Algorithm Generated	Description
U	Unknown, Not Qualified	✓	✓			The value for the data element is not known, and there is no indication from the data source (respondent or document) as to the reason it is missing. Also represents the least specific, and most generic, identification of the reason for the missing value.
D	Deleted for Confidentiality	✓	✓			The information was deleted to protect the confidentiality of the respondent/person/data source. Presumes that the information is known and was intentionally omitted.
R	Refused	✓	✓			The information was sought and the respondent refused to provide it. The respondent may or may not have had the information available.
S	Sought but Unknown	✓	✓			The information was sought from the respondent, who did not know the data value (e.g., Inquiry: "What is your blood type?" Response: "I don't know.").
C	Not Collected/ Applicable	✓	✓			The information was either not sought or is not applicable. Multiple reasons apply to why it was not sought. Examples: For females of childbearing age who have had a hysterectomy, the question on pregnancy status would not be asked; Home street address information is not applicable to non-human entities.

NOTE: Two identified MVR values were determined to be specific to lab information or clinical observations. They will not be included in the global MVR definition and valid value list but will be included in sections for the defined data elements which will be developed in the future. They are defined as follows:

Code	Label	Hardcopy Form	Electronic Form	System Generated	Algorithm Generated	Description
I	In Process, Result Pending	✓	✓			The data element value is pending. It is dependent on another action, and there is an indication that it exists and will be captured at a later time. For example, a lab result is pending or the lab slip is in and the demographics are pending.
X	Lab Value Cannot be Obtained	✓	✓			The value of the data element cannot be obtained. For example, lab results are not available because the sample status is Quantity Not Sufficient (QNS), contaminant, or corrupted.

Program Flexibility in Determining Valid MVR Values

CIPHER definitions allow for variation in use. Not all system will require an MVR for any particular data element, nor will the same set of MVRs be required for any particular element. Further, programs may define additional MVRs to those provided in the CIPHER standard but they may not redefine any of the existing codes. Any additional MVRs that a program defines must be one of the digits 0-9. Using digits allows for the definition of up to 10 program-specific MVRs and readily identifies those MVRs that are unique to the program.

Missing Values

This entire appendix addresses the question of missing values.

Processing Overview

Special requirements apply. Refer to the Implementation subsection on Data Processing: Validations and Edit Checks, below, for detailed information.

EDI Summary

Refer to the Implementation subsection on Data Processing: Electronic Data Interchange, below, for detailed information.

Discussion

Each data element contained in CIPHER includes a definition of valid values (i.e., specific values or a range of values) and the field value for missing data (i.e., blank). The reason the data element is missing is captured in a separate, associated data element called the Missing Value Reason (MVR). The use of blanks for the missing data element value provides a consistent manner of identifying absent values. The move to a consistent approach alleviates the problem of programs using various codes to represent unknown data. For example, some programs use '9', '99', or 'U' to represent “unknown”; '8', '88', or '98' to represent “other”. This mixed approach leads to confusion and mishandling of data.

For example, in System A, information on the number of weeks a mother breastfeeds an infant is collected. Responses range from approximately 98,000 mothers at 0 weeks, to 450 mothers breastfeeding for 97 weeks. Then, surprisingly, there are 5,600 mothers at 98 weeks. This jump in the number of mothers breastfeeding during the 98th week is artificial, and is caused by the fact that the value 98 actually represents, per program definition, all responses in which the mother breastfed for longer than 97 weeks. The apparent increase in week 98 would not be recognized as artificial to an outside user who was not aware that '98' is used to represent “other responses.” This is a good example of how important it is for programs to move toward using a consistent approach in identifying “missing” or “other” data.

In addition to capturing the fact that a data element is missing (i.e., has a value of blank), there may also be interest in capturing the reason it is missing. This can aid in the evaluation of program policies, surveillance activities, and information system processing. The full definition of the MVR concept required the delineation of types of data elements and types of MVRs used to address the full range of processing and information requirements (refer to Definitions, above, for descriptions).

The ability to support program needs was addressed along with definitions of MVR types and values. Each program can determine if a CIPHER stored data element requires a Missing Value Reason (MVRs are optional); if it does, the CIPHER missing value handling will be used. Valid values for the Missing Value Reason have been defined; programs requiring further delineation of the reason for the missing value may define additional values for the MVR (refer to Field Values, above, for descriptions). These values will be mapped to the "U" (Unknown, Not Qualified) value for cross-program use. This provides maximum flexibility for programs, as well as consistency in handling missing values across all CIPHER data elements.

The CIPHER group recognized the need to be consistent with industry standards for handling missing values. The use of a separate field to denote the MVR is consistent with the CDC Core Data Element Implementation Guide and with the direction of many Standards Development Organizations (SDOs), such as HL7.

The CIPHER group also acknowledged the need to provide flexibility in the implementation of MVRs on the data collection side. To streamline data entry, a program can choose to not support a separate MVR field in hardcopy and electronic forms. As needed, the valid values pick list for the associated data element will contain the values for the MVR. The electronic form field display will have a blank in the field and the MVR will be displayed outside the field in the format of "MVR: descriptive label". Refer to the Implementation section, below, for detailed information on MVR data collection and processing options.

Implementation: Missing Value Reason

When a value is missing for a data element, the Missing Value Reason will be stored in a separate field associated with the data element. The Missing Value Reason (MVR) is used to note the reason for the missing value.

Although the MVR data are indeed **stored** in a separate field associated with the data element, a program can choose to **collect** the MVR data such that this separate storage field is relatively transparent to the user. That is, hardcopy report collection options, as well as electronic data entry collection options, have been developed through CIPHER in an effort to facilitate the collection and management of MVR data.

This implementation section discusses two specific methods from which programs can choose in their implementation of MVRs on hardcopy report forms and electronic data entry screens. One method involves the collection of Missing Value Reason data using the associated data element field (one collection field used for both the data element and its associated MVR). This "single field" method applies only to those data elements that have a defined set of valid entry codes. The MVR codes are simply appended to the data element's list of valid entry codes. Refer to pages 12-16 for more information on this collection method.

Another method involves the collection of Missing Value Reason data using a separate collection field (separate collection fields used for the data element and its associated MVR). This "multiple field" method applies to free-form entry type fields. The multiple field method can also be used on data elements that have a defined set of valid entry codes. Refer to pages 17-22 for more information on this collection method.

Data Collection: Hardcopy Report Form – Single Field Collection

The single field collection method applies to data elements that have a pre-defined set of valid entry codes. Check-box fields on the hardcopy report form are used for the collection of MVR data to reflect the valid selection codes/values. In the single field collection approach, check-boxes with the MVR-specific codes are positioned below the check-boxes of the associated data element on which the MVR information is being collected. Thus, to the entry operator, the MVR codes are simply a part of the main data element code set. However, the MVR-related check-boxes are noted on the form in shaded text, to distinguish the MVR codes/values from the data element codes/values.

The single field approach does offer the convenience of "one-stop shopping" (data element code set and MVR code set in one field) for the data collector. In addition, this single field approach assists form developers in optimizing their use of hardcopy form space.

Refer to Figures 1 and 2 below for an illustration of the single field collection approach. Note that these particular examples make use of the Marital Status data element and a subset of the CIPHER MVR code set. The implementation of MVRs for other data elements, as well as the use of different MVR codes, can be patterned after these implementation examples.

Figure 1: **Blank Hardcopy Form used to collect Marital Status and MVR data (Single Field Collection approach)**

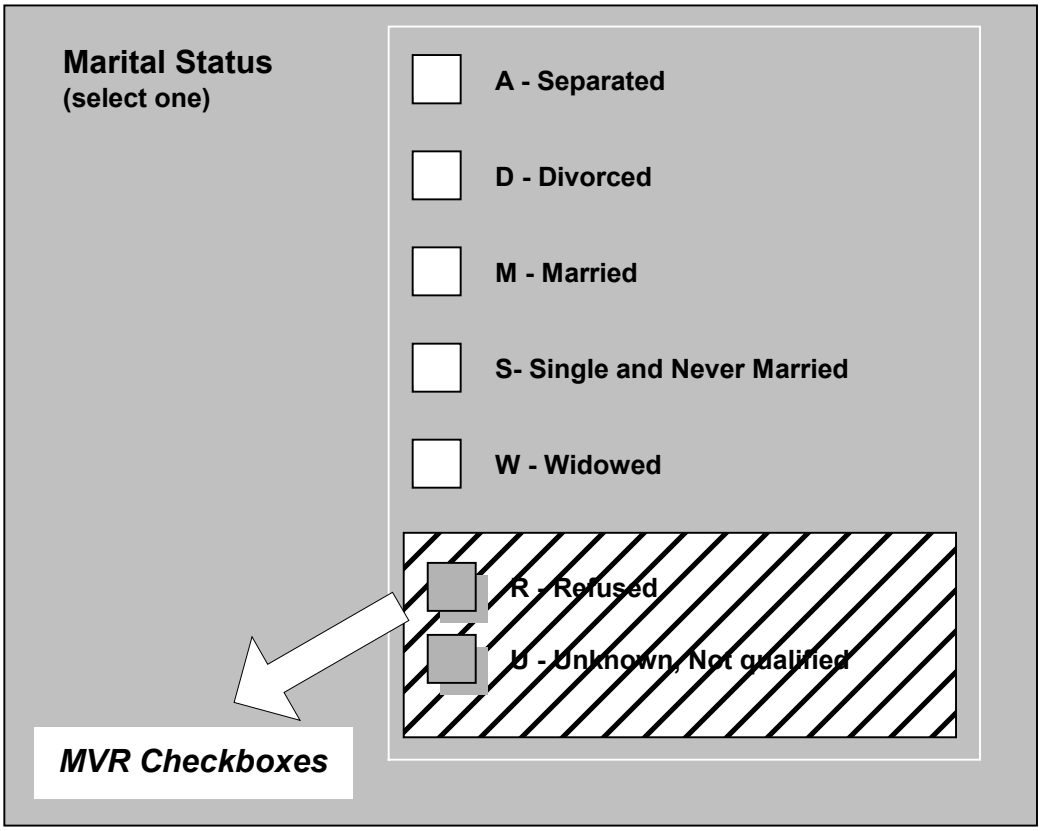
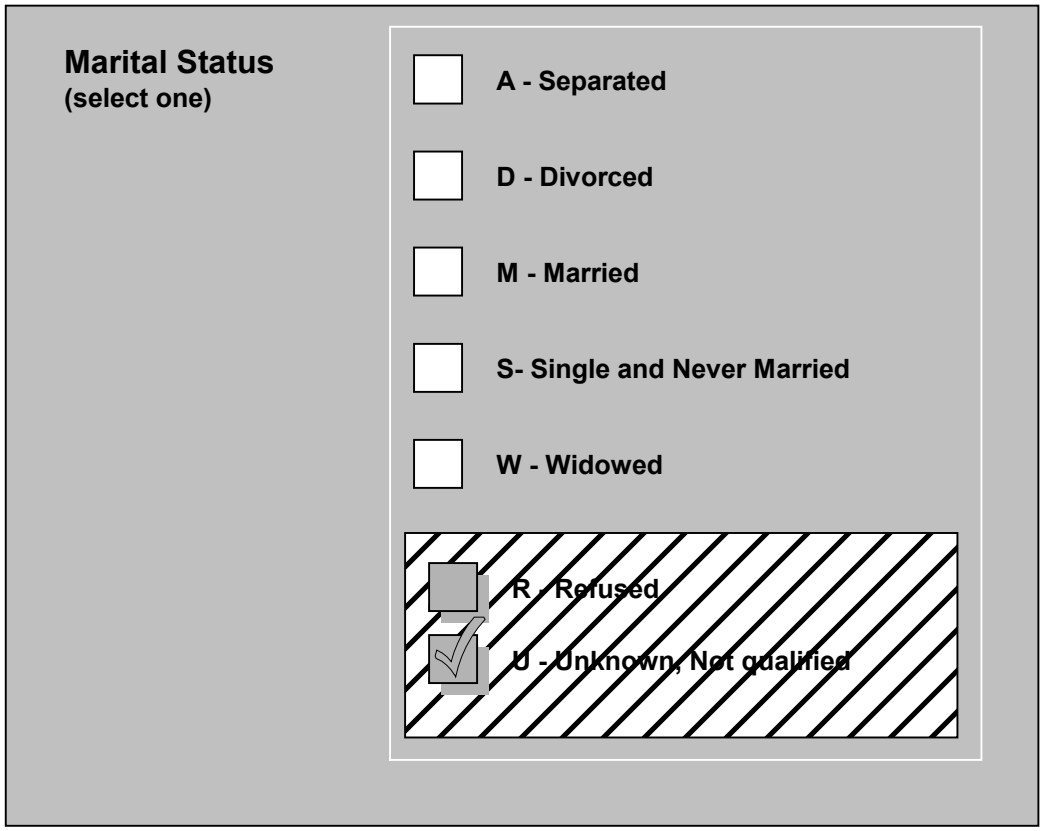


Figure 2: **Completed Hardcopy Form used to collect Marital Status and MVR data (Single Field Collection approach)**



Data Entry: Electronic Form – Single Field Collection

The single field collection method applies to data elements that have a pre-defined set of valid entry codes. To streamline data entry, a program can use the single field collection method to bypass the use of a separate MVR collection field on electronic forms. As needed, the valid values pick list for the associated data element will contain the values for the MVR. The electronic form field display will have a blank in the field and the MVR will be displayed outside the field in the format of "MVR: descriptive label" to distinguish the MVR codes/values from the data element codes/values. Thus, the entry operator can enter the MVR data in the same physical field associated with the main data element.

Although the entry process makes use of the main data element's entry field, selection of an MVR-associated code results in the storage of this code not in the main data element, but in the associated MVR variable. Again, this storage difference is emphasized in the way the MVR code/label is displayed upon entry of an MVR code.

The single field approach does offer the convenience of "one-stop shopping" (data element code set and MVR code set in one field) for the data entry operator. In addition, this single field approach assists designers of electronic entry screens in optimizing their use of screen space.

Refer to Figures 3 and 4 below for an illustration of the single field electronic data collection approach. In addition, refer to Figure 5 for an illustration of processing from hardcopy to storage. Note that these particular examples make use of the Marital Status data element and a subset of the CIPHER MVR code set. The implementation of MVRs for other data elements, as well as the use of different MVR codes, can be patterned after these implementation examples.

Figure 3: **Blank Electronic Form used to collect Marital Status and MVR data (Single Field Collection approach), pull-down menu enabled**

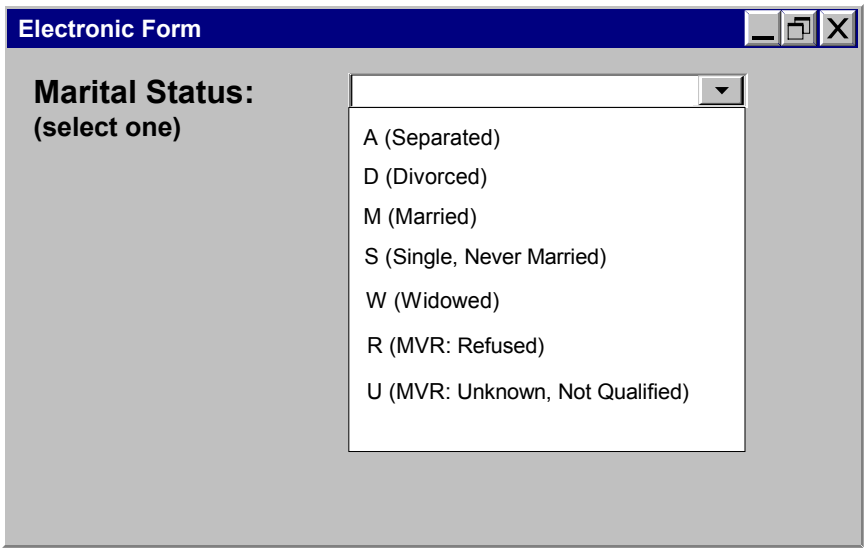


Figure 4: **Completed Electronic Form used to collect Marital Status and MVR data (Single Field Collection approach), MVR selected**

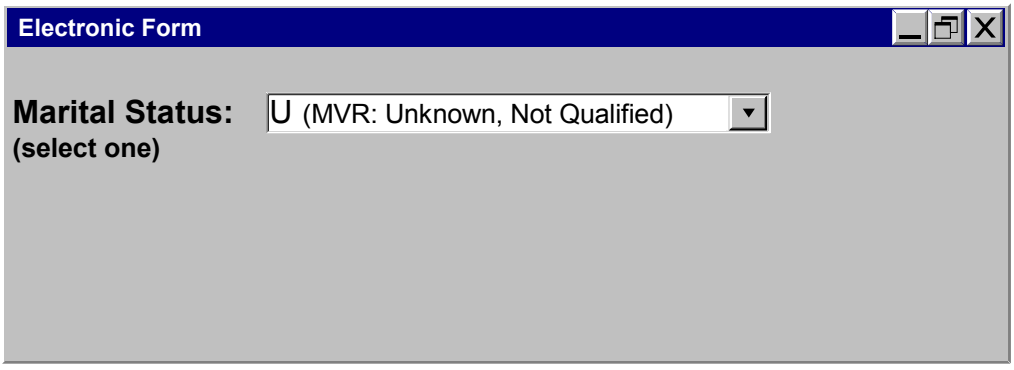
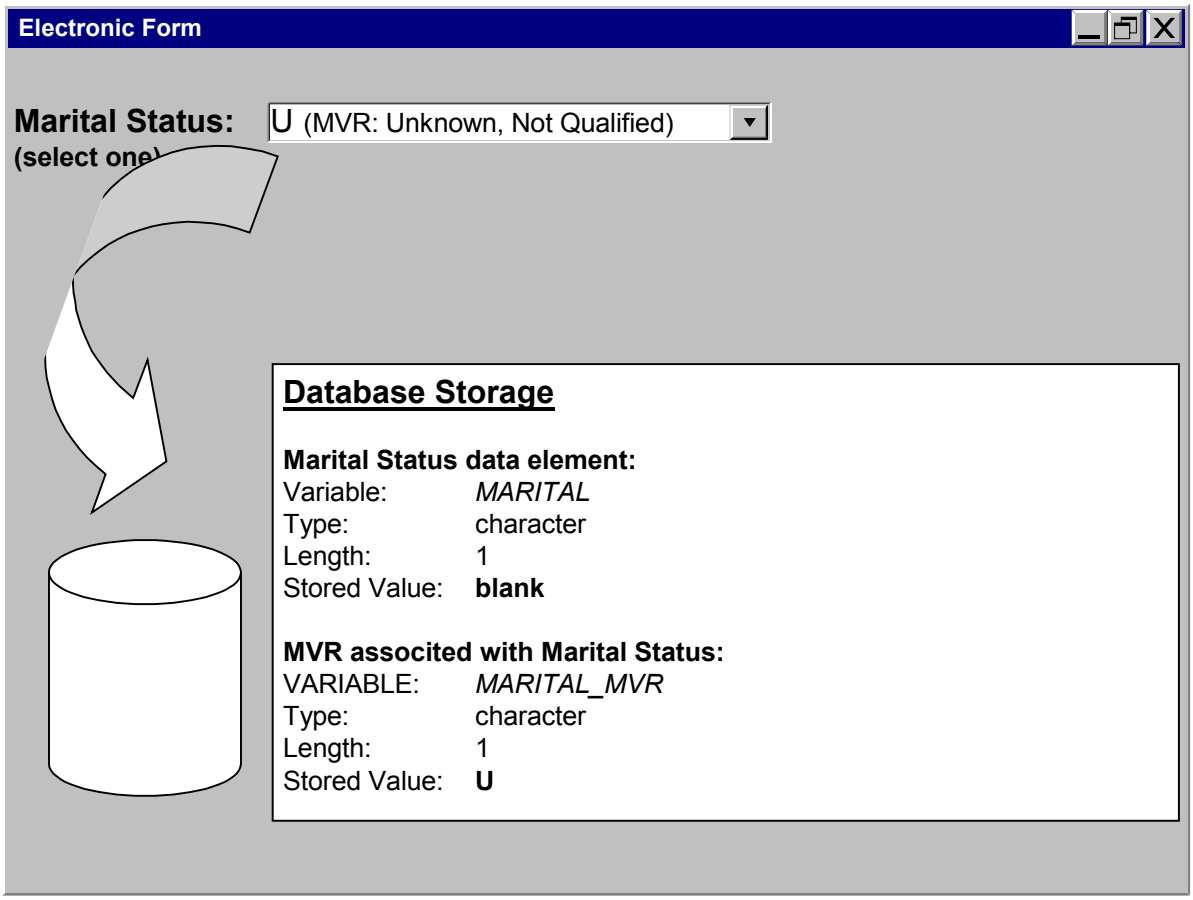


Figure 5: **Completed Electronic Form used to collect Marital Status and MVR data (Single Field Collection approach), MVR selected, Storage of data reflected**



Data Collection: Hardcopy Report Form – Multiple Field Collection

The multiple field collection method involves the collection of Missing Value Reason data using a separate collection field (separate collection fields used for the data element and its associated MVR). This "multiple field" method applies to free-form entry type fields. The multiple field method can also be used on data elements that have a defined set of valid entry codes.

A series of separate 1-character check-box fields is used on the hardcopy report form to collect Missing Value Reason values. Each check-box is associated with a valid value for the Missing Value Reason. Each data element identified by a program area as requiring a Missing Value Reason will be placed on the hardcopy form in close proximity to the associated but separate MVR field.

Refer to Figures 6 and 7 for an illustration of the multiple field collection approach. Note that these particular examples make use of the Person Name data concept and a subset of the CIPHER MVR code set. The implementation of MVRs for other data elements, as well as the use of different MVR codes, can be patterned after these implementation examples.

Figure 6: **Blank Hardcopy Report form section used to collect Name data and MVR data (Multiple Field Collection approach)**

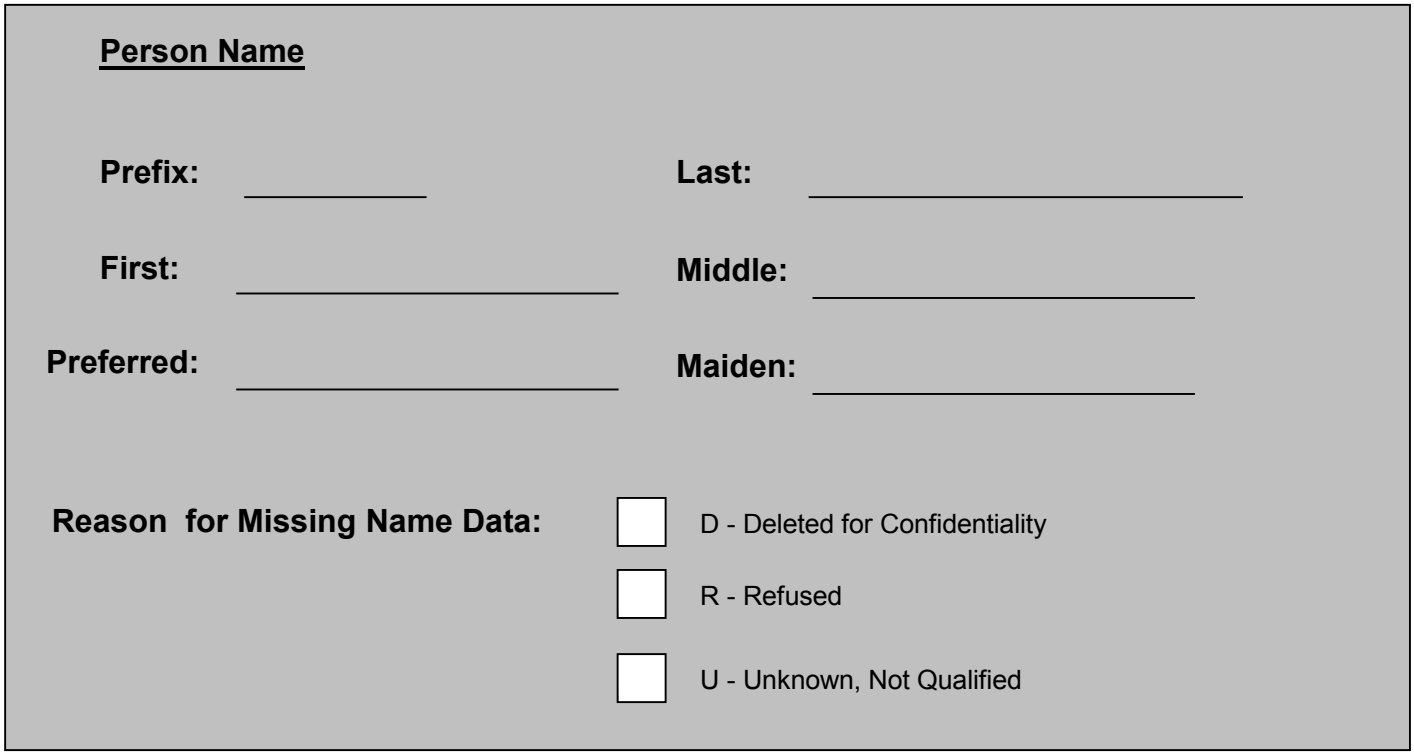
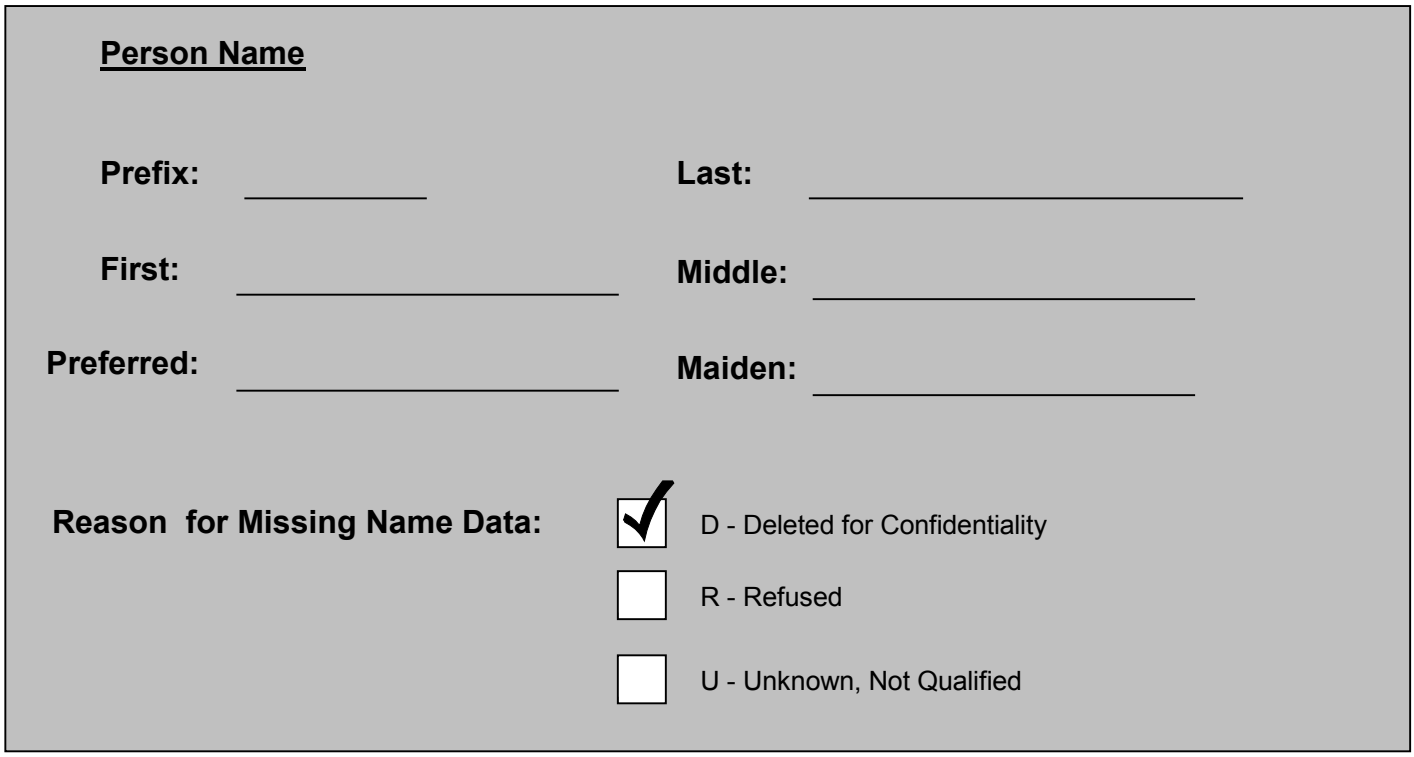


Figure 7: **Completed Hardcopy Report form section used to collect Name data and MVR data (Multiple Field Collection approach), Name data missing, MVR selected**



Data Collection: Electronic Form – Multiple Field Collection

The multiple field collection method involves the collection of Missing Value Reason data using a separate entry field (separate collection fields used for the data element and its associated MVR). A pull-down menu is used to display the valid MVR codes/descriptions. This "multiple field" method applies to free-form entry type fields. The multiple field method can also be used on data elements that have a defined set of valid entry codes.

Refer to Figures 8, 9, and 10 for an illustration of the multiple field electronic data collection approach. In addition, refer to Figure 11 for an illustration of processing from hardcopy to storage. Note that these particular examples make use of the Person Name data element and a subset of the CIPHER MVR code set. The implementation of MVRs for other data elements, as well as the use of different MVR codes, can be patterned after these implementation examples.

Figure 8: **Blank Electronic Form used to collect Name data and MVR data (Multiple Field Collection approach).**

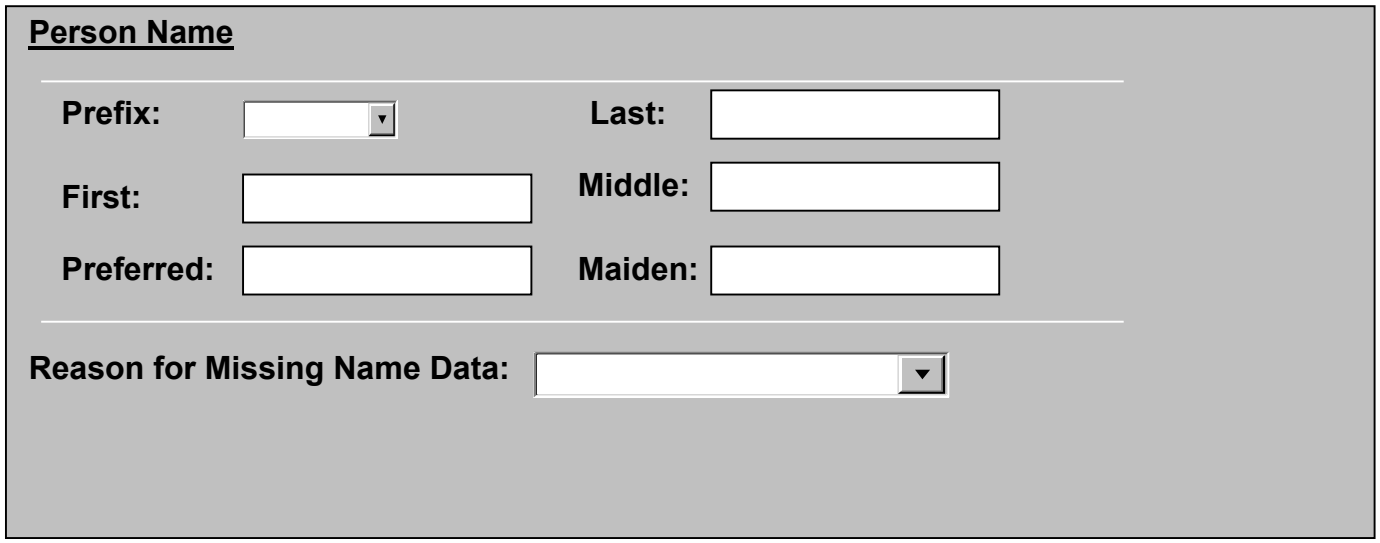


Figure 9: **Blank Electronic Form used to collect Name data and MVR data (Multiple Field Collection approach), MVR pull-down menu enabled**

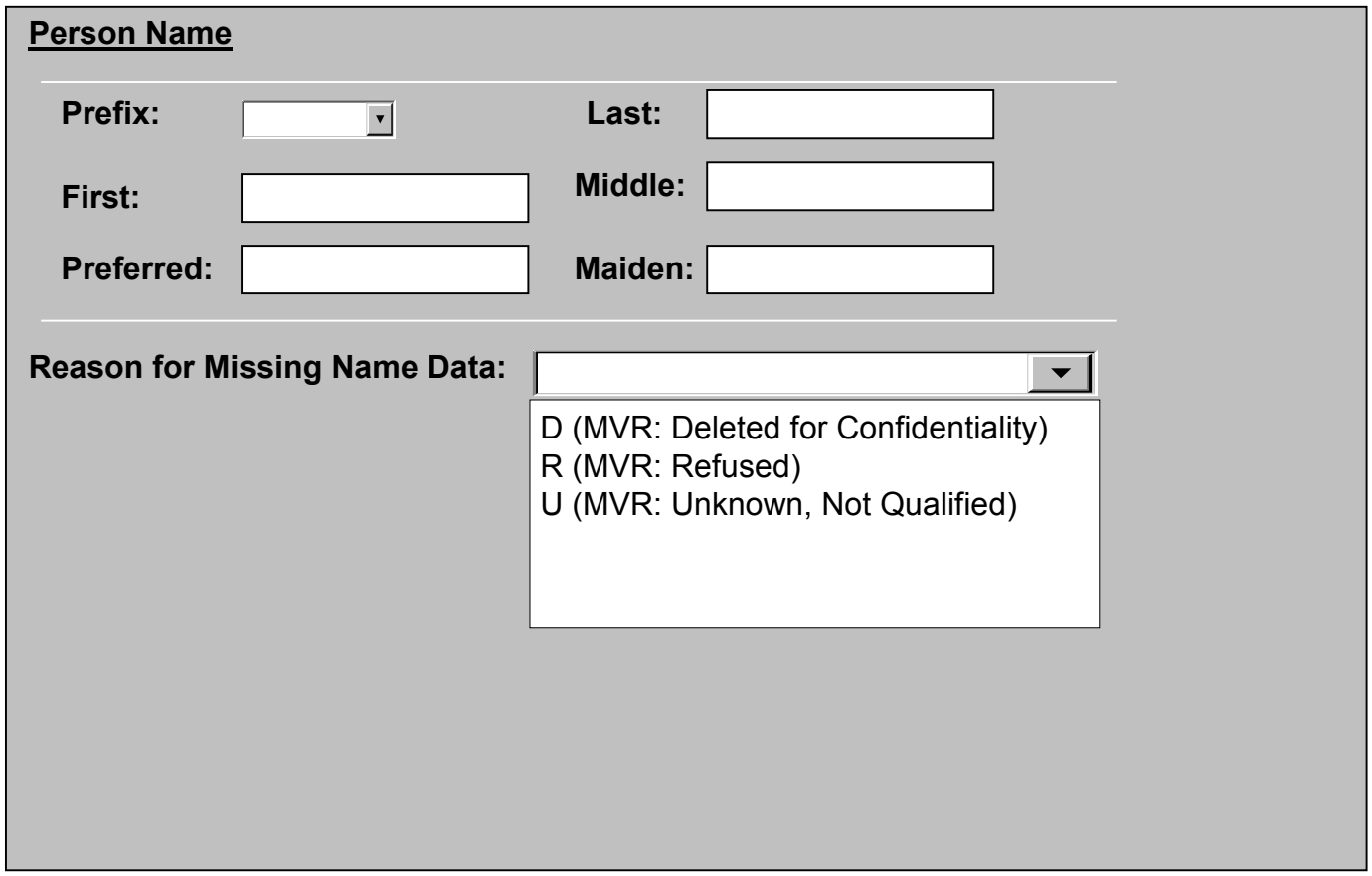


Figure 10: **Completed Electronic Form, Name data missing, MVR code selected (Multiple Field Collection approach)**

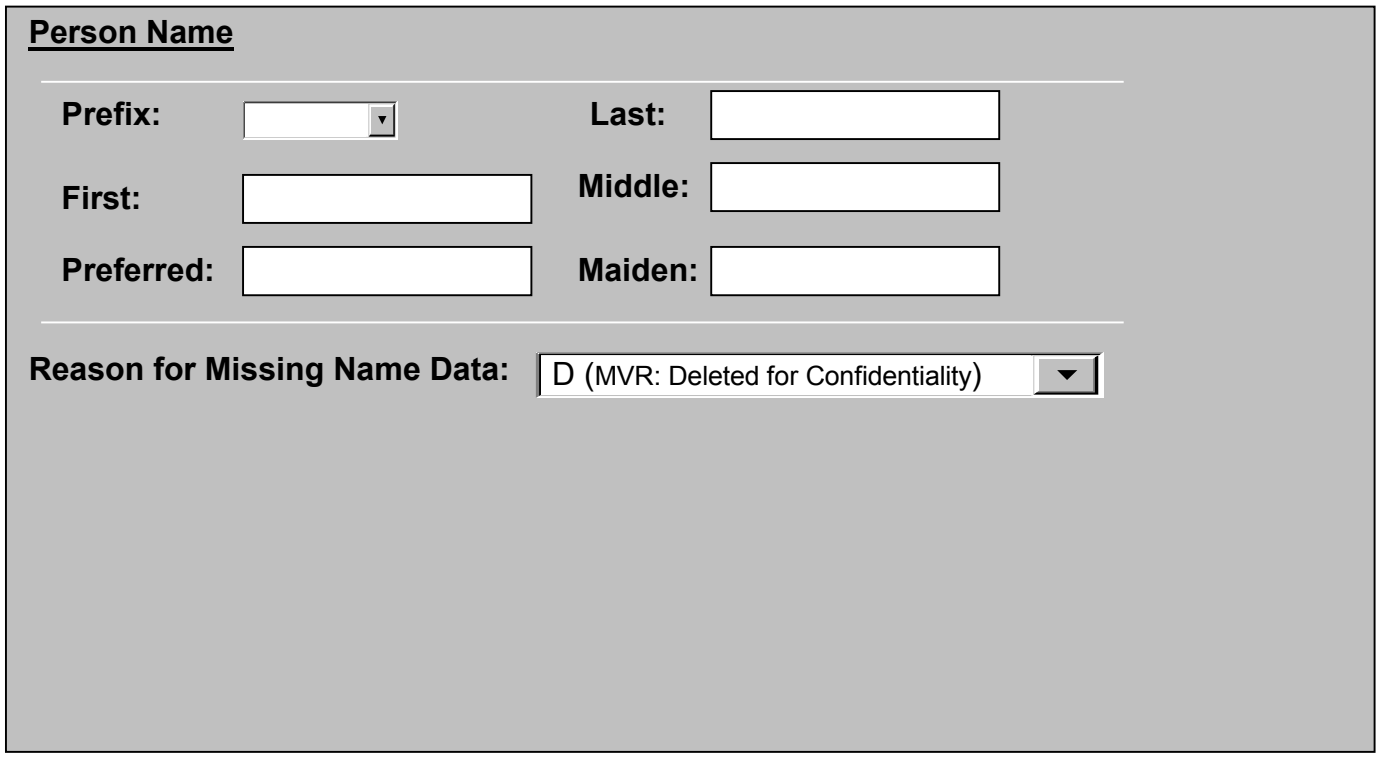


Figure 11: **Completed Electronic Form used to collect Name data and MVR data (Multiple Field Collection approach), MVR selected, Storage of data reflected)**

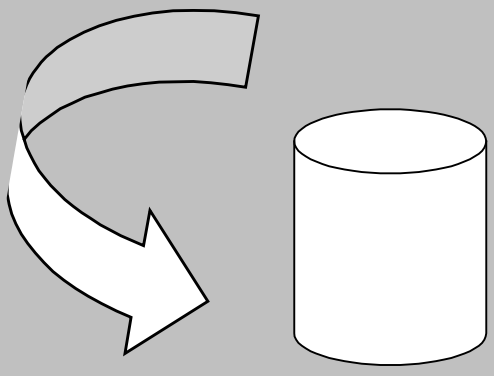
Person Name

Prefix: **Last:**

First: **Middle:**

Preferred: **Maiden:**

Reason for Missing Name Data: D (MVR: Deleted for Confidentiality)



Database Storage

Name of Subject of Report data element

Field	Variable Name	Type	Length	Stored Value
Prefix	*PREFIX*	char	10	**blank**
Last	*SURNAME*	char	35	**blank**
First	*GNAME*	char	25	**blank**
Middle	*MNAME*	char	25	**blank**
Preferred	*PREFER*	char	25	**blank**
Maiden	*MAIDEN*	char	35	**blank**

Reason for Missing Name data element

Variable Name	Type	Length	Stored Value
NAME_MVR	char	1	**D**

Data Processing: Validations and Edit Checks

The Missing Value Reason value is dependent on the value of the associated data element. If the associated data element is not missing (i.e., contains a valid value) the Missing Value Reason must be blank, with one exception. This exception involves data concepts, such as Race, which consist of multiple "check-box" type data elements. If some but not all of the data elements are "checked" and assigned a value of Y (Yes), the associated MVR for the data concept will be automatically assigned a value of Z to indicate a response of "Presumed No" for the remaining "non-checked" and blank data elements.

If the associated data element is missing (i.e., blank) the Missing Value Reason cannot be blank and must contain one of the valid values described above, following the definition for a Selected, Calculated, or System-generated MVR as described in this Appendix.

Validation:

- Alphabetic only
- Must be one of the defined valid values (refer to Field Values, above)
- Cannot be blank if the associated data element value is blank
- Must be blank if the associated data element value is not blank. (An exception is described in the following bulleted item.) A data collection error has occurred if an MVR code is selected/noted for a data element that also has non-blank data selected/entered on the hardcopy form. Electronic entry of MVR data is not permitted with the presence of data in the associated data element field.
- An MVR code of Z to indicate "Presumed No" is acceptable in cases in which a data concept, such as Race, consists of multiple check-box type fields, and only a subset of the check-box fields is missing data. Thus, an MVR can be set to Z, and therefore present, even though some of the data elements for the data concept are non-blank (i.e., are "checked" and set to Y-Yes).
- Only one code is to be selected/entered. A data collection error has occurred if more than one code is selected/noted on a hardcopy form. Only one code can be electronically entered into an MVR field.

Data Collection: Although the MVR data are indeed **stored** in a separate field associated with the data element, a program can choose to **collect** the MVR data so that this separate storage field is relatively transparent to the user. That is, several hardcopy report collection options, as well as electronic data entry collection options, have been developed through CIPHER in an effort to facilitate the collection and management of MVR data. For example, to streamline data entry, a program can chose to not support a separate MVR field on hardcopy and electronic forms. As needed, the valid values pick list for the associated data element will contain the values for the MVR. The electronic form field display will have a blank in the field and the MVR will be displayed outside the field in the format of "MVR: descriptive label".

MVR Cross-System Hierarchy (EDI Rules): The MVR values must pass validation checks before being stored in the database. The processing of incoming EDI messages uses the same system validations to edit the MVR value before storing it in the database. If a system does not use an MVR for a data element and it is required in the outgoing EDI message, it will have a value of blank. If the sending system has program-specific MVR values, they will be converted to the value of "U" (Unknown, Not Qualified) on the outbound message. The processing of MVR fields on EDI messages adheres to the CIPHER-defined values and descriptions for MVR. Examples of EDI messages and MVR handling are provided in Figure 12.

Figure 12: **Illustrations of handling of MVR data in EDI messages**

System Descriptions

System 1: Contains a sample Data Element with an associated MVR.
System 2: Contains a sample Data Element without an associated MVR.
System 3: Contains a sample Data Element with an associated MVR.

Data exchange scenarios

The scenarios shown below provide information on the value of a sample data element, and, where appropriate, its associated MVR value, based on data exchange between our sample systems (System 1, System 2, System 3).

	Data exchange scenario #1	
Data value='4' MVR=blank	**System 1 sends to→System 2**	Data Value='4'

	Data exchange scenario #2	
Data value=blank MVR='I'	**System 1 sends to→System 2**	Data value=blank

	Data exchange scenario #3	
Data value='7' MVR=blank	**System 1 receives from←System 2**	Data value='7'

	Data exchange scenario #4	
Data value=blank MVR='M'	**System 1 receives from←System 2**	Data value=blank

	Data exchange scenario #5	
Data value='6'		Data value='6'
MVR=blank	**System 1 receives from←System 3**	MVR=blank

	Data exchange scenario #6	
Data value=blank	(where '6' is invalid in system #1)	Data value='6'
MVR='E'	**System 1 receives from←System 3**	MVR=blank

	Data exchange scenario #7	
Data value=blank		Data value=blank
MVR='S'	**System 1 receives from←System 3**	MVR='S'

	Data exchange scenario #8	
Data value=blank	(where 'S' is not a valid MVR in system 1)	Data value=blank
MVR='U'	**System 1 receives from←System 3**	MVR='S'

	Data exchange scenario #9	
Data value=blank		Data value=blank
MVR='U'	**System 1 receives from←System 3**	MVR='U'

	Data exchange scenario #10	
Data value=blank	(where 'V' is a system 3-specific MVR, not valid in system 1)	
		Data value=blank
MVR='U'	**System 1 receives from←System 3**	MVR='V'

Data Transmission: Electronic Data Interchange

The handling of a missing value and the associated Missing Value Reason will follow the description in the Electronic Data Interchange (EDI) section for the data element. The individual data element determines the specific requirements for EDI. In general, CIPHER determined that all information should be transmitted to fully represent the data captured in the originating system. Therefore, both the data element missing value and the associated Missing Value Reason will be moved to/from the EDI message for export/import. The scope of the CIPHER EDI discussion was limited to HL7 and ANSI X.12 transactions in order to define processing of these industry standard messages. Other electronic transmission formats are not addressed (e.g., proprietary, state-specific, system-specific) due to their variability, and will need to be defined by the appropriate parties on an as-needed basis.

Health Level 7

Input: Refer to the EDI section for each data element. In general, the Missing Value Reason will be moved from the incoming message to the appropriate Missing Value Reason data element in the receiving system.

Output: Refer to the EDI section for each data element. In general, the Missing Value Reason will be transferred to a Z segment for inclusion in the transmission.

X12

Input: Refer to the EDI section for each data element. In general, the Missing Value Reason will be moved from the incoming message to the appropriate Missing Value Reason data element in the receiving system.

Output: Refer to the EDI section for each data element. In general, the Missing Value Reason will be transferred to an appropriate field in the message for inclusion in the transmission.